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ABSTRACT

This booklet provides an overview of interdisciplinary geography and supplies practical examples of how geography can be linked to other subjects. Because geography is included in new state high school graduation requirements, the subject is making a renaissance in the classroom. Teachers are finding new and exciting ways to integrate geography into existing courses of study, and are revising curricula to incorporate geographic perspectives into other disciplines. The fastback is divided into five sections: (1) "Geography's Renaissance"; (2) "Components of Geographic Understanding"; (3) "Frameworks for Teaching Geography"; (4) "Geography in History and Social Studies"; and (5) "Geography in Other Disciplines." Samples of geographic integration are provided for the subjects of art, English and language arts, foreign language, health, history, mathematics, music, physical education, social studies, and science. Contains 65 references. (EH)

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Teaching Geography in the Disciplines

James B. Binko
Gloria A. Neubert

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Teaching Geography in the Disciplines

by
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and
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Geography's Renaissance

What do the following examples of student activity have in common?

- Students in history are investigating why the Allied army's decision to invade at Normandy rather than at another shore during World War II was a key to the invasion's success.
- Students in economics are studying the reasons for one major port's decline and a neighboring port's emergence as a shipping magnet.
- Students in English are comparing features of the culture depicted in *Zlata's Diary*, the story of a child's life in war-stricken Sarajevo, with features of their own culture.
- Students in science are studying the effect of waste materials from local industries on the capacity of nearby streams to sustain living organisms.
- Students in art are tracing the migration of certain art forms from South and Central America to the Southwest in the United States.

- Students in math are using map scales to figure out the distances between locations and to compute how long it would take to travel from one location to another by auto, train, and plane.

The common thread in all these classroom examples is that students are engaged in higher-level reasoning that cannot yield accurate or adequate explanations without an understanding of geography. They also illustrate that incorporating geographic principles and concepts in other subject areas is not a matter of "piling onto" or "taking away from" the content and skills usually associated with other subjects. Rather, when incorporated effectively, geography is an integral set of understandings and perspectives that gives added meaning and vitality to reasoning in the other subjects.

For example, using a map to identify the location of a specific mineral resource on the earth's surface is not particularly higher-level scientific thinking. However, knowing something about the physical forces that deposited those minerals or the human forces that determine how they are mined and how and where those resources are distributed is the kind of critical thinking that is made possible by applying basic geographic principles.

Likewise, every literary work has a setting. That place is a combination of interdependent physical and human attributes that gives the setting its essential qualities. Complete understanding demands a fuller appreciation of geography's perspective on how and why and where events take place, which is to say, the ability to apply geographic reasoning in order to more fully appreciate a literary setting.

These two examples illustrate the contribution of geography to reasoning in other subjects. Without a geographic perspective, our reasoning in other disciplines is incomplete, because geographic concepts and principles are intrinsically and inextricably linked to all physical and human events and therefore essential to the investigative efforts of students in virtually every subject.

Although the term *geography* has been used since the early days of the Greeks, the subject has suffered an uneven history of neglect and disregard since then, including during most of the 20th century. It was not until the 1990s and the inclusion of geography as one of the five original core subjects of Goals 2000 that national interest was focused again on the place of geography in the American school curriculum.

The commitment to restore geography as an essential feature of the school curriculum is, of course, part of a larger effort to reshape education priorities in our nation. Beginning with the National Commission on Excellence in Education publication, A *Nation At Risk* (1983), and thereafter spurred by polls revealing the alarming ignorance of geography by American students, national interest in geography was awakened. After decades in which geography courses disappeared from the curriculum and entire geography departments were eliminated or merged with other disciplines, geographers and geography educators again are invited to the table of education reform. Gilbert M. Grosvenor, president and chairman of the National Geographic Society, in observing the advances made by geography during the previous decade, commented:

> Everywhere, people are beginning to make the vital connection between geography and America's future. We are beginning to understand that as the world grows smaller and more interdependent daily, our country's future absolutely depends on our ability to see the connections between ourselves and our global neighbors. (1995, p.4)

One result of the current renaissance in geography education is that the subject is a required part of the curriculum, or soon will be, in a majority of the states. A second and more pervasive trend is that elementary and secondary teachers throughout the nation are finding new and exciting ways to integrate geography into existing courses of study and are revising curricula and lesson plans to incorporate geographic perspectives into other disciplines.

The purpose of this fastback is to provide an overview of interdisciplinary geography and practical examples of how geography can be linked to other subjects.

Components of Geographic Understanding

Many of today's adults remember geography as learning the names of cities and land forms, with heavy emphasis on memorizing information and plotting the location of exotic places on maps. A more recent and more enlightened view of geography education conceives it as an eclectic subject with topics ranging from the physical and social sciences to the arts and humanities (Boehm and Petersen 1994). This view is reflected in the recently published *Geography for Life*, in which the following description appears:

> Geography is the science of space and place on the Earth's surface. Its subject matter is the physical and human phenomena that make up the world's environments and places. Geographers describe the changing patterns of places in words, maps, and geo-graphics, explain how these changes came to be, and unravel their meaning. Geography's continuing quest is to understand the physical and cultural features of places and

their natural settings on the surface of the Earth. (Geography Education Standards Project 1994, p.1)

Memorization is a necessary and useful feature of learning in every discipline, including geography. But as this description makes clear, memorization plays only a small part in the time, interests, and methodologies of geographers and their students. They are more interested in questions about the physical and human features of our world, such as how people, places, and environments interact. The interactions between human and physical forces on our planet provide geographers stock for their investigations.

Those investigations — and the content of geography — consist of three essential and interrelated components: 1) subject matter, 2) skills, and 3) perspectives. Geographic subject matter brings together knowledge of the physical and human domains of the world, of relationships between people, places, and environments. Geographic skills engage students in the thinking processes of systematic inquiry: asking geographic questions; collecting, organizing, and analyzing geographic information; and answering geographic questions. Finally, geographic subject matter and skills are investigated from two perspectives: spatial and ecological. The spatial perspective looks at patterns and processes; the ecological perspective provides a lens for observing the myriad relationships between living and nonliving elements (Geography Education Standards Project 1994, p. 11). Each of these components merits specific consideration.

Geographic Subject Matter

Geography provides a study link between the physical and social sciences. Both physical and social scientists advise that the world is an increasingly interdependent community, where environmental and political decisions on one side of the globe may have immediate and long-term effects on physical and human elements on the other side. How the human and physical elements interact is the essential subject matter of the geographer.

Yes, geographers still are interested in land forms. But they also investigate how people use the land and how the land shapes human activity. The authors of *Geography for Life* comment:

> Geographers look at Earth in several ways — as a physical object, as a physical environment, and as a human place. Geographers look at the world as a whole, to understand the connections between places, and to recognize that the local affects the global and vice versa. (1994, p. 32)

The geographer's interests in subject matter, therefore, are not restricted merely to esoteric information about the Earth's surface, but rather include information about the intricate networks of human and physical phenomena that characterize the planet. And, given the world's growing population and the demand such growth places on the planet's resources, the geographer's subject matter is vital to decisions about the destiny of the planet.

In the first half of the 20th century, the United States ruled world economies, shaped global political priori-

ties, and defined the cutting edge of technological progress. Today, however, the United States is only one among many nations competing for the world's physical and human resources. Rather than defining world events, Americans are, as often as not, pushed and shoved by them. All students, whether in the United States or elsewhere, must understand the social and physical infrastructures that link all nations and cultures and the technologies that accelerate the rate by which these structures are modified. Thus the subject matter of geography also is important because it helps students to understand the interdependency of people and where they live and relationships between physical environments and human activities.

Geographic Skills

Geographers rely on an arsenal of skills suited to the task of studying the Earth's physical and human characteristics. Of course, those skills include making graphs, reading maps, making field observations, and constructing models. In the past, students associated only these skills with the work of geographers, a view that limited their understanding of what geographers study and do. A more modern — and considerably broader — interpretation views geographic skills as reflecting a process of inquiry. That is, geographic skills help students to reason "geographically" (Geography Education Standards Project 1994).

This process consists of five basic skills that help students to understand physical and human patterns:

1. *Asking Geographic Questions.* Successful geographic investigation requires the ability and disposition to ask, to speculate on, and to answer questions about why things are where they are and how they got there. Students need to be able to raise questions about their surroundings: Where is something located? Why is it there? With what is it associated, and what are the consequences of its location and associations? What is this place like?

2. *Acquiring Geographic Information.* Geographic information includes data about locations, the physical and human characteristics of those locations, and the geographic activities and conditions of people who live in those locations. Data gathering should involve the student in using primary and secondary sources. Primary sources, especially those associated with fieldwork, may involve students in distributing questionnaires, interviewing, taking photos, recording observations, and collecting samples. Secondary sources of geographic information include, but are not limited to, maps, texts, computer databases, newspapers, directories, and statistical summaries.

3. *Organizing Geographic Information.* Students should be able to organize, arrange, and display information in ways that assist analysis and interpretation. Information should be classified in visual forms, including graphs, tables, maps, and cartograms. Making maps should become as natural and useful as writing a paragraph. This skill requires learning to use symbols to map distributions and movements as well as locations, finding directions and using scales, and thinking critically about

information on maps. It also requires intelligent decisions about selecting the kinds of graphic organizers that best depict the information being assembled.

4. *Analyzing Geographic Information.* In geographic analysis, students engage in the search for patterns, relationships, and connections. As information is organized and interpreted, meaningful patterns emerge; and students can synthesize their information into a coherent explanation. Students should note comparisons and contrasts between areas, recognize patterns, and draw inferences from primary and secondary sources. For example, students should be able to examine maps to discover and compare spatial patterns and relationships; study tables and graphs to determine trends and relationships among data; use statistical methods to identify trends, correlations, and relationships; and investigate written documents to interpret, explain, and synthesize their characteristics.

5. *Answering Geographic Questions.* The successful culmination of geographic investigation is the development of conclusions based on the information collected, organized, and analyzed. The process draws on many intellectual abilities, including the ability to predict, to hypothesize, and to make inferences. It also requires the ability to differentiate conclusions that apply to local situations from those that apply to global situations.

Arriving at geographic conclusions also can draw on inductive and deductive reasoning. Inductive reasoning requires students to draw generalizations by synthesiz-

ing specific examples of geographic information; deductive reasoning necessitates testing generalizations against real-world examples to see if they hold up. Choosing the best means of presenting answers to geographic questions also is a necessary skill. Learning to communicate ideas in effective and stimulating ways is an important feature of answering questions. Students should learn that there are optional ways to reach conclusions and multiple ways of reporting their findings.

It should be apparent to teachers that the skills essential to inquiry in geography also are broadly adaptable to the research methods in other disciplines. Teachers in every discipline encourage students to pose significant questions about the subject matter of the discipline and to raise questions about the dispositions and methods of scholars in the field. Inductive and deductive reasoning are vital thinking skills for developing concepts and principles (Neubert and Binko 1992). Skills associated with collecting, organizing, and analyzing data relevant to an inquiry are regarded as necessities in many disciplines, as is the development of thoughtful and reasoned explanations.

Geographic Perspectives

The geographer enters an investigation with a particular perspective that gives direction and meaning to the collection and analysis of information. Such a perspective makes it possible to interpret world events through a lens polished by experience; it provides a framework for asking and answering questions, iden-

tifying and solving problems, and evaluating the consequences of alternative actions (Geography Education Standards Project 1994).

Two such perspectives that provide the framework for geographic investigation are spatial and ecological. This "bifocal" view makes it possible to understand patterns and processes while attending to the interacting and complex web of relationships between living and nonliving elements. "Where something occurs is the spatial perspective; how life forms interact with the physical environment is the ecological perspective" (Geography Education Standards Project 1994, p. 59). Thus, for an adequate understanding of geographic subject matter and in order to use geographic skills well, both perspectives are required.

Geography is concerned with the spatial features of human existence and activity, and the geographically informed person knows the importance of spatial relationships in making sense of the human story. Where is it? Why is it there? These two questions initiate the fundamental quest of the geographer. They provide the essential boundaries for geographic investigation from the spatial perspective.

The ecological perspective permits students to understand the complex stew of living and nonliving elements that constitutes the Earth's environment. Humans are but one feature of the delicate ecological relationships that sustain life for humans and other species. Humans adapt to their physical and cultural environments; and they also modify their environments, sometimes with profound effects on a local or global scale.

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Using geography's ecological eye allows students to see that human existence depends on the viability of these ecosystems as the source of all natural resources.

Geographers cannot claim a monopoly on these notions of subject matter, skills, and perspectives; many are shared by scholars in other disciplines. For example, subject matter in some other disciplines includes knowledge about how humans interact with their physical environment. Likewise, students in many disciplines must develop skills that enable them to observe patterns, collect and analyze data, and reach plausible solutions and conclusions. Acknowledging these shared notions in no way diminishes the importance of geography. On the contrary, these commonalities reinforce the need to teach and study geography in an interdisciplinary context.

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Frameworks for Teaching Geography

Teachers may be excused for having difficulty sorting through the enormous possibilities for applying geographic subject matter, skills, and perspectives to their teaching. Fortunately, the reform movement in geography education has produced two timely, teacher-friendly documents. Both provide frameworks for teaching geography as a separate subject and as an interdisciplinary subject to be studied across the curriculum. These two documents are *Guidelines for Geographic Education*, which explicates the five fundamental themes of geography, and *Geography for Life*, which sets forth the 18 national geography standards.

Guidelines for Geographic Education

The first of these frameworks was created by the Joint Committee on Geographic Education in 1984. Their *Guidelines for Geographic Education: Elementary and Secondary Schools* may be the single most important document associated with the current renaissance in geography education.

The proposal set forth a K-12 scope and sequence for geography and made certain that memorization, city and river locations, and mountain elevations are not to be viewed as the critical mass of geography education. Instead, emphasis was placed on the interaction of geography knowledge, critical thinking, and problem solving.

Perhaps the most significant contribution of the *Guidelines* to classroom instruction is the delineation of five fundamental themes of geography. These themes are interconnected, rather than exclusive, and taken as a whole, provide a framework for organizing and teaching geographic subject matter, skills, and perspectives.

Location. Considered the basic element of geographic understanding, location refers to the position of physical and cultural features. Locations may be described in absolute terms (using a grid such as latitude and longitude) or in relative terms (a position relative to other locations). Every resource, physical feature, historical event, literary and artistic achievement, cultural landmark, and athletic milestone occurs in a location.

Place. Physical and human attributes that give a location its unique characteristics define a place. Physical characteristics — rich soil, mild climate, natural resources, access to water, proximity to other places — may provide answers to why people are attracted to some places and not others. Place provides the setting for examining all aspects of human activity, productivity, destructivity, and creativity.

Human-Environmental Interaction. This refers to the interconnectedness of people and their environment and the effect they have on each other and to the ways that people depend on, adapt to, and modify their environment. Geographers want to understand how these modifications occur over time and what the consequences have been.

Movement. How people, ideas, energy, and products move from one point to another is characterized as movement. This includes the interdependence of people on networks of transportation and communication. Movement occurs for multiple reasons and results in discernible patterns.

Region. Areas that share unifying human or physical characteristics are identified as regions. The region is an academic concept vital to the geographer's ability to observe, analyze, and explain physical and human events within areas sharing common features.

In the decade since they were introduced, these five fundamental themes have earned wide acceptance from teachers and are an integral feature of geography in-service programs around the nation, including those sponsored by the National Geographic Society's Geography Alliance Program (Binko 1989). Geography teachers, as well as other subject matter teachers, have found the themes useful as a framework for identifying and organizing geography information relevant to their teaching objectives.

These five themes of geography help students to see the distribution of physical and human features around

the globe and the complex relationships resulting from the interaction of humans with their environments. The themes also help students understand the dynamic and ever-changing movement of people, goods, and ideas and the similarities and differences that result from this movement in various places. These core understandings are important to inquiry in all subjects and offer a useful framework for integrating geography across the curriculum.

Geography for Life

The second instructional framework was developed a decade later, in 1994, in response to the inclusion of geography as a core subject in the Goals 2000: Educate America Act. The framework, *Geography for Life: National Geography Standards* (Geography Education Standards Project 1994), sets forth what every American student should learn in grades K-4, 5-8, and 9-12 and specifies the subject matter, skills, and perspectives every student should have to be literate in geography.

The primary purpose of these voluntary standards is to bring all students up to internationally accepted levels of geographic understanding. An ancillary use of the standards is as a framework for teachers in deciding how to give systematic attention to key geographic concepts and principles, either in free-standing geography courses or integrated into other subject matter courses.

There are 18 National Geography Standards grouped into six essential elements:

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The World in Spatial Terms. Geography studies the relationships among people, places, and environments by mapping information about them into a spatial context. The geographically informed person knows and understands:

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective;
2. How to use mental maps to organize information about people, places, and environments in a spatial context; and
3. How to analyze the spatial organization of people, places, and environments.

Places and Regions. The identities and lives of individuals are rooted in particular places and in those human constructs called regions. The geographically informed person knows and understands:

4. The physical and human characteristics of places;
5. That people create regions to interpret Earth's complexity; and
6. How culture and experience influence people's perceptions of places and regions.

Physical Systems. Physical processes shape Earth's surface and interact with plant and animal life to create, maintain, and modify ecosystems. The geographically informed person knows and understands:

7. The physical processes that shape the patterns of Earth's surface; and

8. The characteristics and spatial distribution of ecosystems on Earth's surface.

Human Systems. People are central to geography in that human activities help shape the Earth's surface. Human settlements and structures are part of Earth's surface, and humans compete for control of Earth's surface. The geographically informed person knows and understands:

9. The characteristics, distribution, and migration of human populations;
10. The characteristics, distribution, and complexity of Earth's cultural mosaics;
11. The patterns and networks of economic interdependence;
12. The processes, patterns, and functions of human settlement; and
13. How forces of cooperation and conflict among people influence the division and control of Earth's surface.

Environment and Society. The physical environment is modified by human activities, largely as a consequence of the ways in which human societies value and use Earth's natural resources. Human activities also are influenced by Earth's physical features and processes. The geographically informed person knows and understands:

14. How human actions modify the natural environment;
15. How physical systems affect human systems; and

16. The changes that occur in the meaning, use, distribution, and importance of resources.

The Uses of Geography. Knowledge of geography enables people to develop an understanding of people, places, and environments over time — that is, of Earth as it was, is, and might be. The geographically informed person knows and understands:

17. How to apply geography to interpret the past; and
18. How to use geography to interpret the present and plan for the future.

These standards give teachers a useful framework for selecting experiences that will make clear to their students the value of geography in understanding complex physical and human phenomena. A simple analysis of the 18 standards reveals that geography provides source material for teachers of every other subject matter in the curriculum.

For example, political and economic relationships among people cannot be understood adequately without regard for the spatial distribution of physical resources that are valued in human economies and provide the tug in political decision making among nations. Understanding place and regional characteristics provides insight into the origins of human expression that result in the mosaic of literature, art, and music throughout the world. The key to sustaining and modifying environments essential to life is understanding how physical processes have shaped the world and continue to do so.

Social scientists cannot adequately explain human motivation and activity without understanding how

humans have struggled with their physical environment, as well as with each other, to capture a share of the Earth's resources. Students cannot understand human history without understanding how people have depended on natural resources and how the Earth's physical features interact with its inhabitants in ways that modify human activity. Geographic knowledge also promotes understanding of diverse human cultures and relationships among people and between people and the places where they live.

The "new" geography revealed in the standards "emphasizes the essential nature of the discipline as an integrative and systematic approach to the places, people, and environments of the world" (Marran 1995, p. 23).

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Geography in History and Social Studies

Special attention must be given to the relationship between geography and history. A large volume of literature is devoted to this topic. Indeed, the earliest philosophers and historians speculated about the relationships between people and their environment, and geographic elements were features of ancient histories.

During the post-World War II period, the notion of blending history and geography took hold, sometimes including economics and civics in the new "social studies." This blending now is regretted by many historians and geographers and cited by the latter as a primary reason for the decline of geography courses in elementary and secondary schools and the subsequent rise in geographic ignorance among the nation's population. However, the inclusion of history and geography in the interdisciplinary study of social studies forced curriculum makers and teachers to develop ways of integrating heretofore separate subjects. In fact, a 1956 survey by the National Council of Geography Teachers revealed that geography appeared in the curriculum more

often as part of social studies than as an independent course.

A positive point can be derived from a 1988 study, which showed that geography occupied more time than any other subject in elementary and middle school social studies (Herman 1988). In high school during the same period, geography appeared more often as an integrated feature in history courses and to a lesser extent in courses dealing with political science, international relations, and economics (MacDonald and Czarra 1988). Unfortunately, in a more recent study, analysis of more than 500 history lessons revealed a discouraging picture: 75% of the references to geography were passing references, not substantive (Gregg and Leinhardt 1993).

Many geography educators view the current reform movement as a new opportunity to give geography a secure and prominent role in the school curriculum, either as an independent course, integrated with history courses, or imbedded in social studies courses. Many players in the reform movement, including geographers, see the second and third options as the most attainable and likely routes to pursue. Backler (1988) and Stoltman (1988) see the two disciplines as necessary and inseparable within the social studies. Parker (1991) similarly argues for an integration of geography and history within social studies, especially to enhance multicultural understanding. Ravitch and Finn (1987) view as necessary the inclusion of history and geography at every grade level.

Salter (1989) offers a succinct and compelling case for integrating geography:

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> Every event worth considering has acquired its particular character because of associated factors of geographic setting and human condition. To understand human development is to understand this blend of influences. For that reason, geography should become a major and contributing aspect of all history and social studies courses. (p. 19)

This view is apparent in education reforms during the past decade. Two examples illustrate this view. *The California History-Social Science Framework* (California State Department of Education 1988) recommends the infusion of geography at all grade levels and the formal integration of geography and history in grades 4 through 11. The *Curriculum Standards for Social Studies* (Task Force of the National Council for the Social Studies 1994) includes among its 10 essential themes five that deal extensively with geography subject matter, skills, and perspectives, including the interaction of people with their environments, patterns of production and distribution, the connections among natural resources, technology and human activity, and global interdependence.

Other examples abound in the literature for teachers interested in practical strategies for integrating geography with history or social studies. Some recent and imaginative approaches include:

- Placing a history unit in the context of the five themes of geography. For instance, in a unit on westward expansion in U.S. history, a teacher might use questions to enhance geographic perspectives on the Oregon Trail: Where did the trail begin and

end? (Location) What features of the land either eased or impeded passage along the trip? (Place) How did pioneers change the landscapes over which they traveled? (Human-environmental interaction) How did rivers and mountains influence their travel? (Movement) How are the Great Plains different from Oregon's Willamette Valley? (Regions) (Rocca 1994).

- Developing a series of video programs that highlight selected events in history and integrating geography and history in each program around fundamental understandings: chronology, cause-effect relationships, continuity and change, common memory, and historical empathy (Backler, Patrick, and Stoltman 1992).
- Using a children's story or novel about a historic event to integrate literature, history, and geography. Students might use a matrix for history and another for geography to plan for and develop a background for the story. For example, to teach *Homesick: My Own Story*, a novel set in China during the Cultural Revolution, students would need to learn geographic information about location, place, and region and historical information about Communism and the Cultural Revolution in order to understand the setting and action of the story (Binko and Neubert 1994).
- Developing interdisciplinary units, each on one cultural region. Each unit would include the language, art, literature, music, religion, science, history, and geography of the cultural region. For instance, a

unit on Russia might focus on the interaction of cultural features, political revolution, and climatic conditions (Bigelow 1989).

- Preparing a unit on urban development, investigating the geographic and historic reasons for the rise and decline of urban centers. The teacher might encourage students to use primary and secondary sources to research the origins of an urban community, its ethnic histories, influences of geographic elements in determining location and growth of the community, and literary and artistic contributions of its people. Students might use maps and census data to identify patterns of location and movement within the city and between the city and other cities. They might compare and contrast these features with another urban center in a different region of the nation or world.

In these examples of using the five themes as the framework for incorporating geography, the planning strategy could be adapted to use the national geography standards for the same purpose. Using either framework will promote systematic inclusion of fundamental geography in an integrated course.

By incorporating geography with history or social studies, the teacher gives added dimension to the study of human experience and the variety of human influences shaping our planet. Salter (1989) summarizes the proposal for geography's inclusion:

> Infusion of geography, particularly with history and/or social studies, is a means of calling attention to

the force and significance of geography. As courses give more attention to the role of geographic themes in the unfolding of societal development, not only will students gain a better sense of the role of setting, environment, and the cultural landscape in the development of human society, but teachers themselves will grow more comfortable with such blending of influences. (p. 24)

Geography in Other Disciplines

Geography courses (or history or social studies courses) need not shoulder the entire responsibility for producing students who are geographically literate. In fact, by integrating geographic concepts and principles into their instruction, teachers of other disciplines can help students recognize the interrelatedness of knowledge, thus enhancing student learning of their discipline as well as supporting geographic literacy. Such geographic linkages require no "radical curriculum revisions, massive financial aid, extensive teacher retraining, or the overhaul of existing teacher education courses" (Kirman 1988).

The activities that follow for teaching art, English, foreign language, mathematics, music, physical education, and science are intended as samples for teachers, administrators, and supervisors to use in creating their own curriculum-specific and topic-specific lessons that use geography to enhance student learning.

Art

Students in art classes study how and why art was created by others and also create art themselves. The following activities can be used to link geography with knowledge and appreciation of art created by others, which in turn may inform the student's own artistic endeavors.

- Have students examine paintings and tapestries and inquire about the "geography of the time" (Olwig 1987). For example, what can be inferred about the people, their habits, resources, and so on, from a particular landscape or still life?
- After students have examined the work or works of a particular artist, have them locate on a map or globe the artist's home town. Ask students to hypothesize what cultural, climatic, or physical features might have influenced the artist's work (Hutchings 1989).
- As students observe slides, pictures, or replicas of arts and crafts of various cultures (for example, Zulu art, Japanese origami, Eskimo masks, Navajo sand paintings, Chinese ceramics), they can investigate the global location of each culture and how physical features and natural resources of a region influence the production of arts and crafts.

Following are activities that involve geography in the students' production of art:

- Once students have observed the arts and crafts of various cultures and have investigated how geog-

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raphy influences their production, they can be taught how to produce their own version of these art forms. For example, students can practice writing Japanese characters in the form of calligraphy (Marchetti 1993), can try their hands at imitating Navaho sand painting using colored sand (Patterson and Vetters 1992), or can carve and paint replicas of the brightly colored wooden snake crafts of the Southwest.

- Geographic land forms make excellent subjects for teaching students to use various art materials. For instance, after students are shown visuals of variations in mountain shapes, they can experiment with three-dimensional construction using papier-mâché and poster paints to create their own mountains (Steiner 1993). Or clay can be used to sculpt such land forms as river valleys and mountains (Hutchings 1989).
- Landscapes and land forms also can be studied in order to become the subjects for students learning to create art using computer graphics programs.

English/Language Arts

The three major components of the English/language arts discipline are literature, composition, and language study. These components usually are taught in an integrated fashion, and each provides opportunities for the English teacher to use geographic concepts and principles to support learning.

Indeed, when dealing with literature, it is difficult to find a book that has no connection to geography

(Schreiber 1984). Every narrative has a setting — a time and a place — that has a direct bearing on the characters, events, conflict, and resolution. Because of this direct geographic link, teachers can identify aspects of the five geographic themes — location, physical characteristics, movement, human/environmental interaction, regions — to be taught as background prior to reading or in conjunction with the discussion of the literature. This becomes particularly important in using multicultural literature for which students may not have the appropriate background.

Following are activities that have been used successfully by English/language arts teachers to link literature and geography:

- Migration is a human experience often recounted in narratives. Following or charting the movement of characters in narratives requires the reader to process a chronology of events across time and space. Young children can use simple maps to follow Katy around town as she plows in Virginia Lee Burton's *Katy and the Big Snow* (Pritchard 1989). Middle school readers can use globes and maps to follow Raisha in Scott O'Dell's *My Name Is Not Angelica* as she is snatched from her home as a princess in Africa and sails to her new life as a slave on the island of St. John in the Caribbean. High school readers will find the sea adventures of the classical hero Odysseus easier to follow if they trace his journey on a map. Students also can create their own maps as they read descriptions of the places described as the characters move about a setting.

Children's literature, such as the *Frog and Toad* books, are excellent for this type of activity (Fitzhugh 1992).

- World literature, an examination of literature from a global perspective, can be taught in the traditional chronological or genre approach, or it can be experienced from a geographical approach. Students might explore world literature genres (oral traditions, poetry, drama, novels, nonfiction) in four geographical units — Africa, the Americas, Europe, Asia — and generalize "the uniqueness within cultures and the common bonds among cultures" (Baltimore County Public Schools 1993, p.17).
- For independent reading either at home or through a reader's workshop, students can read their way across the United States or around the globe. Readers can "color the location of the book they have read on a map included on a book report form. This report is shaped like a train, and all the forms are connected on a bulletin board created to represent a puzzle-like map of the United States" (Sisson 1990). A similar bulletin board can be displayed for the readings of world literature, and students can place their completed reports or pegs with their book titles on the appropriate location.
- Students can compare and contrast folk tales and fairy tales from various countries. For example, "The Tale of the Anklet" from *One Thousand and One Arabian Nights*, "Benizara and Kakezara," and "The Indian Cinderella" are three versions — Persian, Japanese, and Canadian, respectively — of the clas-

sic Cinderella story. Comparisons and contrasts of physical, economic, and cultural geography can be made between and among the tales.

- Students will have difficulty comprehending a narrative if their backgrounds do not allow them to visualize the story — to see a movie in the mind — as the plot unfolds. For instance, students living in a suburb of Baltimore or downtown Los Angeles will have difficulty understanding and appreciating the plot of Jean Fritz's *Homesick: My Own Story* if they have no experience that allows them to visualize the regions of Hankow (French, British, and Japanese concessions) or the Bund near the Yangtze River in China. Videos, filmstrips, slides, or pictures of these locations and land forms can help students create a mental map of the setting of this novel.
- As with artists, students can be introduced to authors and their homelands. Students can investigate or hypothesize how the culture, climate, and physical features of an author's home influenced the setting and characters of the literary work.

Geography also can be connected with writing activities in the English classroom:

- The teacher can assess the students' understanding of the setting of the story through a drawing coupled with a brief verbal description by having students create a postcard for the setting of their reading (Fitzhugh 1992). Students send postcards recommending the book to friends or can assume

the persona of the main character and in a contrived mailing send it to another character in the story.

- The thought pattern of description can be coupled with the students' understanding of the physical characteristics of a place in writing a composition intended to create a verbal picture of the setting of a short story, narrative poem, or novel.
- Students can exchange letters with pen pals from countries or regions where their literature is based. Students can be encouraged to employ the thought patterns of comparison and contrast by discussing with their pen pals the similarities and differences between their respective homes (Kirman 1988).
- Students can write original stories or narrative poems about an imaginary trip they might take to a particular geographic area. The specifications for the writing would include authentic description of the setting of their writing. Or the students could write a composition describing a recent trip they actually took (Hutchings 1989). The teacher might ask the students to concentrate on helping the reader "see" what they saw from the car, train, bus, or airplane window as they take the reader on these excursions.
- After studying the poetry of a particular culture and the associated cultural geography, students can write their own poems in the style of the culture, including appropriate attention to topics and language of the culture (Tomasino 1993).

Language study in the English classroom also can use geographic content:

- Teachers can lead students in investigating how some nonspecific words have a geographic basis as well as another definition. For example, the nonspecific word "cataract" might be known to students as an abnormality of the eye, but may be unknown as a specific type of waterfall.
- Teachers might use visuals, such as pictures, models, or slides, in priming students on vocabulary essential to their upcoming reading. Such geographic land forms as "mesa" and "canyon," essential to visualizing the setting of the reading, can most efficiently be taught by means of concrete representations.
- Students can be "word investigators," finding the origin of words with a geographic basis, such as "corn belt," "river valley," "waterspout," and "delta."
- Language can be studied from a sociolinguistic perspective, that is, language as it relates to geography, sex, age, situation, and so on. Students can continue as "word investigators," finding and explaining the origins of words and phrases that are unique to particular parts of the United States. For example, in the Deep South, someone who experiences prosperity is "living in high cotton." And in Cajun parts of Louisiana, a small stream that becomes dry in the summer is a "coulee" (Kilpatrick 1993).

Foreign Language

Teaching a foreign language would not be complete without imbedding a study of the cultures where the language is spoken. The goal is to help students under-

stand cross-cultural differences and develop an appreciation for the culture in the lands where the language they are studying is used. Because the culture of a country "emerges from all the effects of a people's relationship to the land on which it settles" (Barnada 1991, p. 8), the study of geography is essential for developing global awareness.

In addition to teaching aspects of cultural geography directly in the foreign language classroom, the following activities can be used to link geography with the study of a foreign language:

- Excursions to local restaurants that feature dishes of a country where the foreign language is spoken is a popular activity for students and teachers. Teachers might instruct students to note the names of the entrees they order and the ingredients they can identify. In class the next day, students who ordered the same or similar dishes can be grouped and asked to note popular meats, spices, or vegetables used in this country's foods. Generalize how the climate affects the agriculture and therefore the food in that country. Compare and contrast to the food popular in various parts of the United States.
- Teachers can use a similar inductive activity for the clothes or costumes worn in a country. Parents and community members whose heritage matches the foreign language being studied can be invited to wear or bring samples of clothing and costumes to class. Students can generalize about how the cli-

mate affects the growing of certain crops for making materials for clothing and how the weather affects the choice of certain types of clothing.

- Teachers might ask students to read the labels in the clothing in their homes to see if they or their family members have any clothing from a country where people speak the language being studied (Hutchings 1989).
- Students can discuss early exploration routes and how various cultures are now located in specific areas of the United States, for example, Spanish in Mexico and Florida (Hutchings 1989).
- Students can work in groups to become tour guides for a country (Reinhartz and Reinhartz 1990) or region of a country, or to develop a travel brochure for each country or region where the foreign language is spoken. Students will have to use primary and secondary sources to research landmarks, climate, settlement patterns, history, resources, and so on, in order to present a report intended to attract the interest of tourists. After the students have heard or read the information prepared by their classmates, the teacher might have them decide which country or region they would prefer to visit.
- Teachers might encourage students to write to pen pals, a traditional bridge between cultures that remains an excellent way for students to learn about the geography of a country from a key informant.
- Students who will travel where the foreign language is spoken might keep a journal to record observations about the environment and society they

experience. Teachers can encourage students to take photographs or to buy postcards of strategic landmarks and give the students a map to use in tracking their travels while touring. Before departing, students might be asked to predict from the information on the map. For example: How long will it take to get to the next destination? What land forms might they see? What temperatures might they expect? What might the clothes of the inhabitants be like? What foods might be popular? In what occupations might the natives be engaged? After they return, students can share photographs and significant passages from their journals.

Health

Health is fast becoming a separate subject or unit in many school programs. In most states, health units begin in elementary school, and successful completion of a semester-long course in health is required for high school graduation. The link between health and geography lies in the relationship of people and their environment and how such interaction can improve or destroy the health of the population. In recent years, the term, "medical geography," has been applied to this relationship (Hunter 1988). Following are activities that show how geography can be linked in the classroom study of health:

- As students study common infectious diseases, such as the Ebola virus, cholera, and various strains of influenza, they can take an epidemiological

approach by mapping the places of origin and distribution of these diseases. How human movement from location to location influences the transmission of the diseases can then be examined.

- The types and availability of medical services in various regions of the United States and around the world can be studied, charted, and mapped. Contrasts in services can be made between urban and rural areas in the United States and between the United States and other countries. Changing demographics can be studied to predict the future need for medical services in various locations.
- In a unit on nutrition, students can study the essential characteristics of a healthy American diet, then analyze typical diets of people in various regions of the world. The physical characteristics of the land and climate as they influence the dietary habits can be investigated.
- Hygiene can be studied as it relates to water supply and sanitation conditions in various parts of the United States and the world.
- Medical conditions, such as cardio-pulmonary disease, can be related to pollution and smog in the natural environment.

Mathematics

In 1989 the Commission on Standards for School Mathematics of the National Council of Teachers of Mathematics approved and published their *Curriculum and Evaluation Standards for School Mathematics*. Heralded

by many as a model for the development of standards in all the disciplines, the mathematics standards have guided curricular revampings and preservice and in-service teacher training efforts.

"Standard 4: Mathematical Connections for Grades K-4, 5-8 and 9-12" underscores that students must view mathematics as a practical, useful subject that can be applied to real-world situations and to solving problems that arise in other disciplines. Thus geography becomes a fruitful subject for the application of mathematics.

Following are activities that allow students to apply arithmetic or general mathematics concepts and associated computations to geography content:

- Students can use addition and subtraction to interpret bus, train, and air travel schedules. They can determine travel times and distances between their homes and specified destinations (GENIP 1987).
- Units of different currencies in various countries can be compared and contrasted. Ratios can be learned or practiced by converting prices in foreign currencies to dollars (Bednarz 1988).
- Students can practice constructing and interpreting line graphs, bar charts, pie charts, and so on by graphing geographical information, such as population in various regions and agricultural imports and exports of a country (Bednarz 1988).
- Teachers can ask students to locate on a map where famous mathematicians were born and worked and to research the international origin of aspects of modern mathematics (Bednarz 1988).

- Teachers can create an imaginary trip for students to take and have students use maps to note the distance and therefore the amount of fuel needed for the trip and the total cost of the fuel at current prices (Kirman 1988).
- Teachers can give students practice in mastering basic math facts by playing *Math Across America*. "Students work their way across a United States map displayed on a prominent and accessible bulletin board, 'traveling' various routes on the map by successfully recalling basic math facts along that route" (Miller 1992, p. 47). As students travel into various states, they are given an opportunity to visit for a while in that state and study the state's size, population, resources, and so on, through a series of activities that involve the students in using primary and secondary sources.
- "Math Safari" is an integrated activity that uses information children find in reading books to solve math problems about animals. Groups of three students are assigned an animal to investigate, are given questions about the animal that require mathematical solutions, then locate the data they will need and collaboratively solve the problem. Sample problem: If 48 baby giraffes are born on a given day in Africa, how many are likely to die within one year? The information required to solve this problem is that three-fourths of all giraffes are killed by predators in their first year (Stanko 1992).
- The mathematical skills of ratio, proportion, multiplication, division, large number comprehension,

fractions, and percentages can be strengthened by applying these calculations to word problems dealing with such global issues as population, poverty, waste, and hunger. For example: "At current growth rates it will take twenty years for Nicaragua's population to double. At this rate, how many people will there be in Nicaragua in a century, for every one there today?" (Schwartz 1983).

- Teachers might divide the world map into time zones and have students calculate time differences between the United States and other countries (Marchetti 1993) or use topographic maps and have students calculate differences in elevation (Hutchings 1989).
- Teachers can provide students with climatic data and have them practice their skill in converting between metric and English standard measurements (Hutchings 1989).

The following activities can be used with higher-level mathematics, including statistics, geometry, and business math:

- Students can apply their knowledge of "mean" and "median" by computing the "mean center" of a population, drawing conclusions about causes for shifting centers, then comparing and contrasting various countries' mean centers (Enedy 1993).
- Every ten years, the U.S. Census Bureau conducts a national census of the population. The result is a database that tells "who we are, how and where we live, how we are housed, and what changes are tak-

ing place in the socioeconomic fabric of our country" (Bureau of the Census 1992). In addition, the bureau counts crops, livestock, farms, mines, factories, businesses of all types, housing starts, retail sales, and other features. Math students can use this geographic data related to spatial patterns and relationships to apply their mathematical knowledge of big numbers, graphing, means, medians, and other concepts.

- State and district boundaries can be used to show students how geometry and constructions apply to the real world. For example, students can work to answer: 1) Is either Colorado or Wyoming a parallelogram or a rectangle? 2) Nevada appears to be a trapezoid except for one small corner. Allowing for the exclusion of this corner, is it a trapezoid? 3) The upper western border of the state of Delaware is an arc of a circle. Which city is the center of the arc? (Johnson and Boswell 1992).
- Dirichlet polygons can be used by students of geometry to identify how territorial divisions were decided (Haggett 1983) or to determine the mean rainfall over a region containing several rain gauges (O'Shea 1986).
- The business math class can apply its knowledge of accounting to expenses incurred to run a state or local park (Hutchings 1989). Students can visit the park, notice what is needed to keep it clean and operational, interview park officials concerning ecological problems that arise from the interaction of society and the environment, examine expense data

provided from the park services, then develop a budget and ledger system for operations.

Music

Linking music to geography can provide students with background enrichment to develop appreciation of a composition, insight as to how a piece can best be sung or played, and information about cultural geography.

- Teachers might ask students to collect song titles and lyrics from contemporary songs that contain geographic terms (for example, "river" and "mountain"). Popular examples are John Denver's "Rocky Mountain High" and Cocker and Warnes' "Up Where We Belong." Then students might write impressions of these geographic terms based on the images they see when listening to the songs. Students can generalize that land forms can take on a happy or sad mood depending on whether the composer and lyricist write the music to express these land forms as barriers or a "lofty place of power" (Byklum 1994).
- The background of ballads involving seas and shipwrecks (for example, "The Wreck of the Edmund Fitzgerald") can be studied by using nautical charts and weather maps (Gordon 1984).
- Classical music that depicts foreign landscapes (such as the Czech "Vltava" from "Ma Vlast" by Smetana) can be played in conjunction with color slides of the river and villages in order to help the

students create images as they listen to the music (Wise 1979), thus facilitating their appreciation of the musical piece.

- Students might research the origin of band and orchestra instruments. Locate their place of origin on a map. Discuss how the resources of the area contribute to the production of particular instruments (Hutchings 1989).
- The birth places of specific composers and lyricists being studied can be located on maps (Kirman 1988). Physical characteristics of the places and historical happenings can provide insights into the motivation for the composer or lyricist using specific themes.
- "Music of the World" can be a theme for the year. Students would listen to and perform native pieces (such as African music from Zaire and Botswana, South East Asian music from Thailand and Indonesia, or Middle Eastern music from Egypt and Turkey) with the teacher helping students understand the location, physical characteristics, and environment and societal interaction of the countries being studied. Students will see the music as a reflection of the culture and grow in their appreciation and understanding of the country, as well as of the music.

Physical Education

The wide-ranging curricula of physical education courses include traditional sports but also involve

students in other physical aspects of education, such as fitness, board games, folk dances, and outdoor education. Like teachers in other disciplines, the physical education teacher can find many ways to use geography to enhance student learning.

"Sports Geography," the "study of geographic dimensions of sports, emphasizing such topics as origin, diffusion, and distribution of American sports and athletes, sports regions, and regional recruiting patterns," as defined by Eastern Michigan University professor Carl Ojala (Leatherman 1994), is a branch of cultural geography.

Following are examples of how to infuse geography into the discipline of physical education:

- Spectator and participant sports can be introduced by having students research their origin and popularity in various countries (for example, baseball in United States, Cuba, and Japan). The effect of climate and physical characteristics of the lands can be studied to determine the reason for their popularity (Hutchings 1989).
- The birth places of athletes associated with particular sports being played in the physical education class can be located on maps (for example, Siri Larsen, a Cambodian gymnast living in the United States).
- "Current Events" have a place in the physical education classroom. Teachers can set aside time during the week for students to share the latest happenings in the sports world. For example, during a major ten-

nis match, the semi-finalists' and finalists' native countries (such as Steffi Graf from Germany versus Arantxa Sanchez Vicario from Spain; Pete Sampras from the United States versus Goran Ivanisevic of Croatia) can be located on the classroom wall map. Local sports events, such as the attempt to build a new stadium in a different part of the state, can be studied for advantages and disadvantages to humans and the environment of each suggested location.

- The Olympics provide a unique time for infusing geography into the physical education class. Students can map where the Olympics are currently being held, where they have been held in the past, and which countries participate and excel in particular sports. Climatic conditions and how athletes have to adapt to different climates also can be studied (Hutchings 1989).
- Students can attend to their physical fitness by participating in "Walk Across America." Students walk daily on school campuses and record the miles on a wall map to reach specific U.S. destinations (Breitenbach 1995).
- Rainy days can be used to bring out the board games. The place of origin of games, such as checkers in France, Parcheesi in India, and tic-tac-toe in Egypt (UNICEF 1995) and the history of their creation can make a rainy day very interesting in physical education class.
- Students who are embarking on a folk dance unit can begin by locating the place of origin of each dance. For example, the "Dance of Greeting" from

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Denmark, the "Minuet" from France, and the "Hava Nagila" of Israel have interesting histories in their countries (Howard County School System 1986).

- Treasure hunt games can involve students in making and reading maps and using a compass (Kirman 1988).

Science

Because they study both the natural environment and the interaction of physical and human forces, geographers have much in common with biologists, botanists, chemists, geologists, physicists, environmentalists, and ecologists. Topics, such as animal life, plant life, climate, pollution, natural disasters, and hydrology, all have links to geography. The following activities integrate geography and various areas of the science:

- Students might investigate scientists related to the topics they are studying, for example, the bonesetters guilds in ancient Africa and Egypt; Solomon Carter Fuller of Liberia, who studied in the United States and traveled in Africa and was a pioneer in studying Alzheimer's disease; Bernardo Alberto Houssay of Buenos Aires, Argentina, who pioneered work on the pituitary gland; and Madge Skelly, an Iroquois Indian who worked with adults and children who could not speak and developed a sign language based on the sign language of the Plains Indians (Prince George's County School System 1993). As students research such scientists, they locate and map the birthplaces of the scientists

and the travel routes used by the scientists as they conducted their investigations and made their contributions.

- The native habitats of animals being studied can be located and compared and contrasted. For example, the bison of North Dakota and the water buffaloes of the Philippines can be studied as cousins. Similarly, the flora found in several areas, such as the Gobi and Mojave deserts, can be located and compared (Dunn 1989-1990). The physical characteristics of the region where specific animals or plants are found also can be studied for suitability.
- In chemistry class, students can select an element from the periodical table. Each student then investigates the person who made the discovery, as well as the location and characteristics of the country and region where the discovery was made (Hutchings 1989).
- The migration routes that animals take for their food and water can be plotted, resulting in a discussion of whether a particular animal species might be endangered. Similarly, the original homes of fruits and other plants, as well as the physical conditions of the world's locations where they have been transplanted, can be analyzed (Reinhartz and Reinhartz 1990).
- In physics class, geographic issues can be used to demonstrate the physical laws that undergird them. For example, the physical principles of "heat" can be studied in conjunction with the geographic topics of climate and consequences to vegetation and

industries. The scientific concepts of "reflection" and "refraction" can be revealed as the basis for the explanations of the geographic phenomena of "twilight" and a "mirage." Connections between "condensation" experiments and "cloud formation" can be made (Carey 1976).

- In an earth science unit on natural disasters, teachers can introduce students to the scientific principles that explain such geographic events as earthquakes, tornadoes, tsunamis, volcanic eruptions, droughts, hurricanes, and floods. Students can map the locations where these disasters have historically occurred and investigate the physical conditions of the regions of the world where each natural disaster is most likely to occur.
- The study of pollution can be a year-long endeavor in the science classroom, with students maintaining a bulletin board of pictures and news articles related to pollution problems, causes, and solutions in their city, town, or state.
- Young children can be helped to develop a respect for nature and learn how nature interacts with humans by having a class adopt a tree (James 1992). Then, using the tree for shade, they discuss how trees help humans and the environment. Books about trees can be read (Lerew 1992) for reference information and developing appreciation of the tree's contributions. This topic later can be broadened to a study of rain forests in the world through reading, looking at picture books and maps, viewing videos, and visiting exhibits on the rain forest (Singer 1992).

- While studying amphibians, the decline in the frog, toad, and salamander populations in many areas of the world can be studied in relation to the destruction of natural habitats, pollution, and changes in the ozone layer (Blaustein and Wake 1995).
- The topic of acid rain can be studied in the science class by teaching students how to use litmus paper to test for acids and bases, and then having students test a variety of household liquids for their acid or base content. Then students can collect rain, lake, and pond water samples and test them for acidity. They can study the hydraulic cycle and how gaseous emissions change the water cycle into the acid rain cycle. And they can discuss what causes acid rain and how acid rain has affected the environment (for instance, the need to restore the Statue of Liberty). Teachers might ask students to look for evidence of how acid rain has harmed their own communities (Adams and Adams 1992).

References

Adams, Renee B., and Adams, Neil D. "Acid Rain: A Teaching Focus for the Intermediate Grades." *Childhood Education* 68 (Annual Theme Issue 1992): 282-84.

Backler, Alan L. *Teaching Geography in American History*. ERIC Clearinghouse for Social Studies/Social Science Education. Bloomington, Indiana, 1988. ED 299 222.

Backler, Alan L.; Patrick, John; and Stoltman, Joseph. "Geography in US History: A Video Project." *The Social Studies* 83 (March-April 1992): 58-63.

Baltimore County Public Schools. *Grade 10 World Literature Resource Guide*. Towson, Md.: Board of Education of Baltimore County, 1993.

Barnada, Kurt. "Integrating Culture and Geography: Techniques to Combat Ethnocentrism in the Foreign Language Classroom." Paper presented at the Annual Eastern Michigan University Conference on Languages and Communication for World Business and the Professions, Ypsilanti, 1991. ED 345 575.

Bednarz, Sarah W. "Further Suggestions for Integrating Geography Across the Curriculum." *Journal of Geography* 87 (May-June 1988): 105-106.

Bigelow, Bruce. "A Geographical Perspective of World History: Contribution to an Interdisciplinary Course."

Journal of Geography 88 (November-December 1989): 221-24.

Binko, James B. *Spreading the Word About Geography*. Washington, D.C.: National Geographic Society, 1989.

Binko, James B., and Neubert, Gloria A. "A Geography Framework for the Interdisciplinary Study and Teaching of Literature." Paper presented at the Annual Meeting of the National Council of Geographic Education, Lexington, Ky., November 1994.

Blaustein, A.R., and Wake, D.B. "The Puzzle of Declining Amphibian Populations." *Scientific American* 272 (April 1995): 52-57.

Boehm, Richard G., and Petersen, James F. "An Elaboration of the Fundamental Themes in Geography." *Social Education* 58 (April-May 1994): 211-32.

Breitenbach, Celeste H. "Timonium Elementary Students Attempt Walk Across the U.S." *York Road Gazette*, May 1995.

Bureau of the Census. *Census Bureau Education Program*. Washington, D.C.: Data User Services Division, 1992. ED 367 556.

Byklum, Daryl. "Geography and Music: Making the Connection." *Journal of Geography* 93 (November-December 1994): 274-78.

California State Department of Education. *California History-Social Science Framework*. Sacramento: California State Department of Education, 1988.

Carey, W. Maclean. "The Correlation of Instruction in Physics and Geography." In *Geography and the Integrated Curriculum: A Reader*, edited by Michael Williams. London: Heinemann Educational Books, 1976.

Commission on Standards for School Mathematics. *Curriculum and Evaluation Standards for School Mathematics*. Reston, Va.: National Council of Teachers of Mathematics, 1989.

Dunn, James R. "Estranged Sisters in the College Classroom: Biology and Geography." *Journal of College Science Teaching* 19 (December 1989-January 1990): 168-71.

Enedy, Joseph D. "Geography and Math: A Technique for Finding Population Centers." *Journal of Geography* 92 (January-February 1993): 23-27.

Fitzhugh, William P. "Geography and Literature: The Literacy Connection." Paper presented at the annual conference of the State of Maryland International Reading Association Council, Towson, 1992. ED 359 109.

Geography Education National Implementation Project (GENIP). *K-6 Geography: Themes, Key Ideas, and Learning Opportunities*. Skokie, Ill.: Rand McNally, 1987.

Geography Education Standards Project. *Geography for Life: National Geography Standards*. Washington, D.C.: National Geographic Society, 1994.

Gordon, Jeffrey J. "How to Teach Comprehensive Geography Skills: 'The Wreck of the Edmund Fitzgerald'." *The Social Studies* 75 (September-October 1984): 186-92.

Gregg, Madeleine, and Leinhardt, Gaea. "Geography in History: What Is the Where?" *Journal of Geography* 92 (March-April 1993): 56-63.

Grosvenor, Gilbert M. "1995 Urban Institute and Instructional Leadership Institute Graduation Ceremonies." Program. Washington, D.C., 1995.

Haggett, Peter. *Geography: A Modern Synthesis*. 3rd ed. New York: Harper & Row, 1983.

Herman, Wayne L. "Development in Scope and Sequence: A Survey of School Districts." *Social Education* 52 (September 1988): 385-88.

Howard County School System. *Physical Education Curriculum Guide*. Maryland: Howard County Board of Education, 1986.

Hunter, John M. "Geography and Public Health." In *Earth '88: Changing Geographic Perspectives*, edited by H.J. deBlij. Washington, D.C.: National Geographic Society, 1988.

Hutchings, Janice H., ed. "Geography in Indiana. Geographic Integrating Ideas: Ideas and Lessons to Integrate Geographic Concepts into Various Grade Levels and Subjects in K-12." *Geography Educators' Network of Indiana*, 1989. ED 317 440.

James, Alfred. "Will It Hurt 'Shade'?" *Childhood Education* 68 (Annual Theme Issue 1992): 262-63.

Johnson, Art, and Boswell, Laurie. "Geographic Constructions." *The Mathematics Teacher* 85 (March 1992): 184-87.

Joint Committee on Geographic Education. *Guidelines for Geographic Education: Elementary and Secondary Schools*. Washington, D.C.: Association of American Geographers and National Council for Geographic Education, 1984.

Kilpatrick, James J. "English, As We Speak It in America." *The* (Baltimore) *Sun*, 18 August 1993, p. 15A.

Kirman, Joseph M. "Integrating Geography with Other School Subjects." *Journal of Geography* 87 (May-June 1988): 104-105.

Leatherman, Courtney. "A Professor's Passion for Sports and Geography." *Chronicle of Higher Education*, 6 April 1994, p. A5.

Lerew, Everett D. "Ecological Resources on Trees." *Childhood Education* 68 (Annual Theme Issue 1992): 264-66.

MacDonald, Duncan, and Czarra, Fred. *Geography and the States: Report on the 1988 Survey*. Washington, D.C.: Council of Chief State School Officers, 1988.

Marchetti, Bethany. "Japan's Landscape in Literature." *Journal of Geography* 92 (July-August 1993): 194-200.

Marran, James F. "Geography for Life: World Class Standards for All Students." In *Spaces and Places: A Geography Manual*

for Teachers, Geographic Education National Implementation Project (GENIP). Skokie, Ill.: Rand McNally, 1995.

Miller, Darcy E. "Math Across America: Motivating Learners with Mild Disabilities." *Teaching Exceptional Children* 24 (Winter 1992): 47-49.

National Commission on Excellence in Education. *A Nation at Risk: The Imperative for Educational Reform*. Washington, D.C.: U.S. Department of Education, 1983.

National Council of Geography Teachers. *The Status of Geography in Secondary Schools of the United States*. Normal, Ill., 1956.

Neubert, Gloria A., and Binko, James B. *Inductive Reasoning in the Secondary Classroom*. Washington, D.C.: National Education Association, 1992.

Olwig, Kenneth R. "Art and the Art of Communicating Geographical Knowledge: The Case of Peter Brueghel." *Journal of Geography* 86 (March-April 1987): 47-51.

O'Shea, Thomas. "Dirichlet Polygons: An Example of Geometry in Geography." *The Mathematics Teacher* 79 (March 1986): 170-73.

Parker, Walter C. *Renewing the Social Studies Curriculum*. Alexandria, Va.: Association for Supervision and Curriculum Development, 1991.

Patterson, Kathie, and Vetters, Linda. "Geography of the Desert: An Interdisciplinary Approach." *Journal of Geography* 91 (July-August 1992): 143-49.

Prince George's County School System. *The Science Program of the Elementary Milliken II Schools — Grade 6*. Maryland: Prince George's Board of Education, 1993.

Pritchard, Sandra F. "Using Picture Books to Teach Geography in the Primary Grades." *Journal of Geography* 88 (July-August 1989): 126-36.

Ravitch, Diane, and Finn, Chester. *What Do Our Seventeen-Year-Olds Know: A Report on the First National Assessment of History and Literature*. New York: Harper & Row, 1987.

Reinhartz, Dennis, and Reinhartz, Judy. *Geography Across the Curriculum*. Washington, D.C.: National Education Association, 1990.

Rocca, Al M. "Integrating History and Geography." *Social Education* 58 (February 1994): 114-16.

Salter, Christopher. "Teaching Geography Across the Curriculum." *NASSP Bulletin* 73 (December 1989): 19-24.

Schreiber, Joan. *Using Children's Books in Social Studies: Early Childhood Through Primary Grades*. Washington, D.C.: National Council for the Social Studies, July 1984. ED 241 404.

Schwartz, Richard H. "Poverty + Hunger = Global Issues." *Journal of Geography* 82 (March-April 1983): 76-78.

Singer, Judith Y. "People, Parks and Rainforests." *Childhood Education* 68 (Annual Theme Issue 1992): 271-74.

Sisson, Jeanie. "Read Your Way Across the U.S.A." *Journal of Geography* 89 (July-August 1990): 175-77.

Stanko, Anne. "Math Safari." *Learning* 21 (August 1992): 43-45.

Steiner, Stanley F. "Preparing Prospective Elementary Teachers to Teach Geographical Features with an Integrated Approach." *Journal of Geography* 92 (September-October 1993): 231-33.

Stoltman, Joseph P. *Geography and History in the Curriculum: Relationships Between Space and Time*. Chicago: Rand McNally, 1988.

Task Force of the National Council for the Social Studies. *Curriculum Standards for Social Studies*. Washington, D.C.: National Council for the Social Studies, 1994.

Tomasino, Kathy. "Literature and Social Studies: A Spicy Mix for Fifth-Graders." *Social Studies and the Young Learner* 5 (March 1993): 7-10.

United Nations Children's Fund (UNICEF). *Games Around the World*. Bridgeport, Conn.: WJ Fantasy, 1995.

Wise, John H. "The Value and Use of Music in Geographic Education." Paper presented at the National Council for Geographic Education Conference, Mexico City, 1979. ED 186 337.

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